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ORIGINAL RESEARCH

Assessment of haematological profile of patients with chronic liver disease: A Cross-Sectional Study

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Abstract
Background: Chronic liver disease (CLD) is a long-term condition characterized by the gradual destruction of liver tissue over time, leading to impaired liver function. The present study was conducted to assess haematological profile of patients with chronic liver disease (CLD).
Materials and Methods: 72 patients with chronic liver disease (CLD) of both genders were enrolled. Haematological parameters: haemoglobin, total leucocyte count (TLC), differential leucocyte count (DLC), packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular haemoglobin concentration (MCHC), reticulocyte count, platelet count and mean platelet volume, and red cell distribution width (RDW) etc. were recorded.
Results: Out of 72 patients, males were 40 and females were 32. The haematological profile was macrocytic type with neutrophilic leucocytosis with TCP in 13, dimorphic picture (normocytic to macrocytic) in 3, hypochromic microcytic in 2, macrocytic hypochromic in 1, macrocytic hypochromic with TCP in 20, microcytic hypochromic in 2, microcytic hypochromic with TCP in 11, normocytic normochromic with TCP in 16, severe anaemia microcytic hypochromic in 2 and spherocytes with TCP in 2 patients. The difference was significant ($P< 0.05$). The mean Hb (g/dL) was 10.4, 8.5 and 5.2, TLC (per ml) was 8.9, 10.8 and 9.4, HCT (per 100%) was 27.4, 26.3 and 23.9, MCV (femtolitre) was 89.3, 89.5 and 86.2, MCHC (g/dL) was 29.7, 29.3 and 29.0, reticulocyte count (per ml) was 1.4, 1.8 and 1.9, platelet count (per ml) was 70.5, 64.3 and 63.1, prothrombin time (sec) was 15.8, 17.2 and 18.5 and RDW (per 100%) was 19.2, 18.7 and 19.0 in mild, moderate and severe anemia cases. The difference was significant ($P< 0.05$).
Conclusion: The majority of patients with chronic liver disease had anaemia, leukopenia, and TCP.
Keywords: Anaemia, Chronic liver disease, leukopenia, Thrombocytopenia

Introduction

Chronic liver disease (CLD) is a long-term condition characterized by the gradual destruction of liver tissue over time, leading to impaired liver function.[1] The final stages of chronic liver disease (CLD) are fibrosis and cirrhosis, which are caused by a gradual deterioration of the liver echotexture.[2] Increased rates of morbidity and mortality can result from coexisting problems including bleeding and infections. There are occasions when it is linked to abnormalities in the blood.[3] Numerous underlying factors can contribute to CLD, such as nutritional inadequacies, bleeding, excessive alcohol use, and anomalies in the hepatic protein manufacturing process or in the production of proteins involved in blood formation or coagulation. All things considered, a wide range of distinct haematological illnesses are associated with CLD. More precisely, jaundice, portal hypertension, and hepatocellular failure all impact the blood picture. Hypersplenism and CLD are frequently linked.[4] The most common and important sign of liver disease is fatigue. Most of the time, patients experience vague symptoms that they interpret as weakness, listlessness, exhaustion, drowsiness, lack of endurance, and

low vitality. Interestingly, "afternoon" fatigue—as opposed to "morning" weariness—occurs after action or exercise and can occasionally become severe or obvious following enough rest.[5]
For this reason, it is also known as "afternoon" fatigue. Patients with liver illness usually experience intermittent fatigue that changes in severity over time. Numerous liver diseases can result in the aching or discomfort in the right upper quadrant, which is commonly referred to as "liver pain." Anaemia in CLD is caused by iron deficiency, hypersplenism, chronic disease anaemia, autoimmune haemolytic anaemia, folic acid deficiency, aplastic anaemia, and as a side effect of antiviral drugs.[6]
In simple cirrhosis, it is typically of moderate severity and either normochromic, normocytic, or mildly macrocytic. Microcytic hypochromic anaemia may develop if cirrhosis is exacerbated by bleeding or hemolysis.[7]
Aim and objective: The present study was conducted to assess the haematological profile of patients with chronic liver disease (CLD).

Materials and Methods

The present cross-sectional observational study was conducted on 72 patients with chronic liver disease (CLD) of both genders in the Department of General Medicine, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India. The duration of the study was from August 2021 to August 2023. The Institutional Ethics Committee gave the study its approval. All were informed regarding the study, and their written consent was obtained. Data such as name, age, gender, etc. was recorded.

Inclusion Criteria

- Patients to give written informed consent.
- Patients attending ANMMCH Hospital as outpatients and inpatients during the study period.
- patients with chronic liver disease (CLD) who were over 20 years old, of any gender, and had chronic hepatitis C, chronic hepatitis B, non-alcoholic steato-hepatitis (NASH), primary biliary cirrhosis, autoimmune hepatitis, Wilson's disease, or hemochromatosis.
- Patient's age between 20-60 years.
- Available for follow up.

Exclusion Criteria:

- Patients who don't gave written informed consent.
- Patients with acute hepatitis, drug-induced acute hepatic damage, fulminant hepatic failure, malignancy at the time of presentation, or jaundice linked to a seasonal viral infection.
- Pregnant women
- Those unable to attend follow-up.

Sampling Size Determination and Sampling Technique

The following simple formula would be used for calculating the adequate sample size in prevalence study

$N= Z^2 P (1-P)/d^2$

N= sample size, Z= level of confidence, P= prevalence, d= Absolute error or precision

Z = Is standard normal variate (at 5% type 1 error (P< 0.05) it is 1.96 and at 1% type 1 error (P<0.01) it is 2.58). As in majority of studies P values are considered significant below 0.05 hence 1.96 is used in formula. p = Expected proportion in population based on previous studies or pilot studies.

The sample size was calculated using a single population proportion formula, by considering, 95% confidence level, a 5% margin of error, and a 4% estimated proportion of overall prevalence

Sample size = $1.96^2 \times 0.04 (1-0.04)/0.05^2$

=59

Considering 10% non-response rate, the total minimum sample size for study was 65 patients. We included 72 (more than the minimum required number of cases) patients with chronic liver disease (CLD) in the present study.

Haematological parameters: haemoglobin, total leucocyte count (TLC), differential leucocyte count (DLC), packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular haemoglobin concentration (MCHC), reticulocyte count, platelet count and mean platelet volume, and red cell distribution width (RDW) etc. were recorded.

Statistical analysis

The data was entered using Microsoft Windows Excel, and the statistical analysis was done using the Statistical Package for Social Sciences (SPSS) version 21.0. In order to investigate the distribution of a number of quantitative and categorical variables, an SPSS descriptive statistical analysis was done. We used frequency (%) and mean ± standard deviation to summarise categorical data (haematological parameters, Child-Pugh score). To determine whether there is a statistically significant difference between the mild, mild, moderate, and severe categories of anaemia, a one-way analysis of variance (ANOVA) was employed. A p-value of less than 0.05 indicates statistical significance for the experiment.

Results

Table: I Distribution of patients

Total- 72		
Gender	**Males**	**Females**
Number	40 (55.56%)	32 (44.44%)

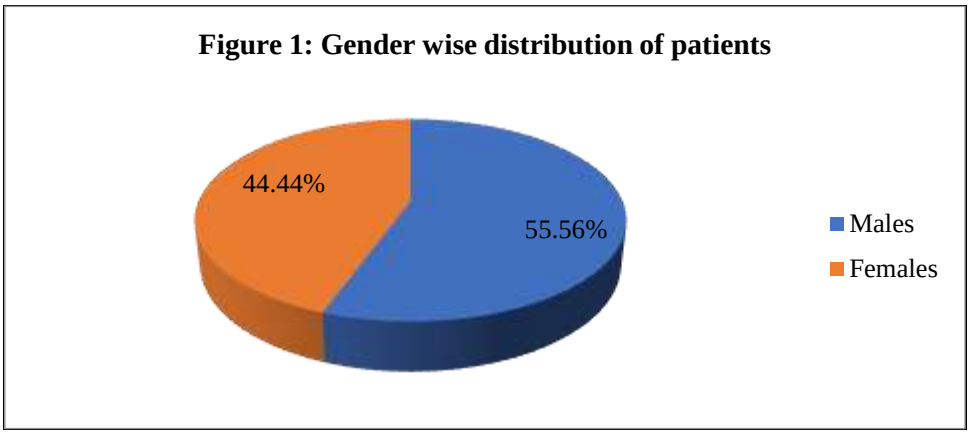

Table I, Figure 1, shows that out of 72 patients, males were 40(55.56%) and females were 32(44.44%).

Table II: Distribution of chronic liver disease patients based on haematological profile

Haematological profile	Number (n=72)	Percentage	P value
Macrocytic type with neutrophilic leucocytosis with TCP	13	18.05	0.05
Dimorphic picture (normocytic to macrocytic)	3	4.17	
Hypochromic microcytic	2	2.78	
Macrocytic hypochromic	1	1.39	
Macrocytic hypochromic with TCP	20	27.78	
Microcytic hypochromic	2	2.78	
Microcytic hypochromic with TCP	11	15.28	
Normocytic normochromic with TCP	16	22.22	
Severe anaemia microcytic hypochromic	2	2.78	
Spherocytes with TCP	2	2.78	

TCP =Thrombocytopenia

Table II, figure 2, shows that haematological profile was macrocytic type with neutrophilic leucocytosis with TCP in 13, dimorphic picture (normocytic to macrocytic) in 3, hypochromic microcytic in 2, macrocytic hypochromic in 1, macrocytic hypochromic with TCP in 20, microcytic hypochromic in 2, microcytic hypochromic with TCP in 11, normocytic normochromic with TCP in

16, severe anaemia microcytic hypochromic in 2 and spherocytes with TCP in 2 patients. The difference was significant (P< 0.05).

Figure 2: Assessment of haematological profile

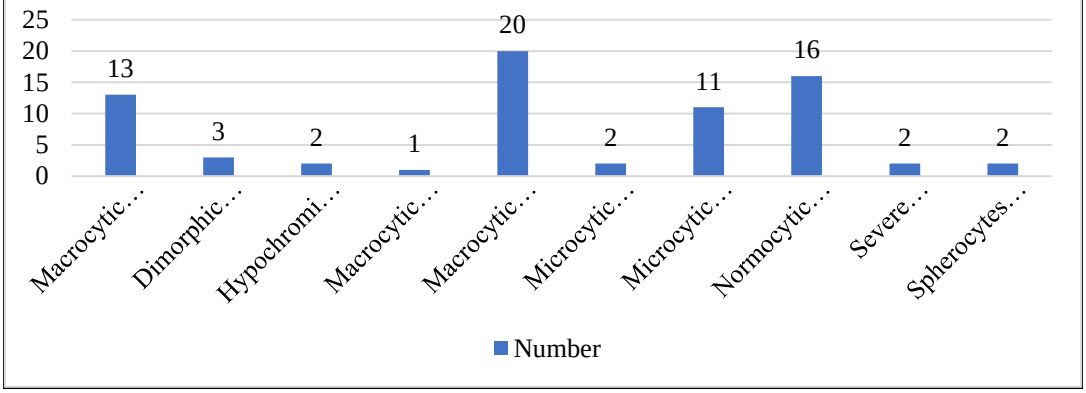

Table III: Laboratory investigations based on severity of anemia

Parameters	Mild	Moderate	Severe	P value
Hb (g/dL)	10.4±1.25	8.5±1.03	5.2±0.72	0.05
TLC (per ml)	8.9±2.65	10.8±3.51	9.4±3.80	0.91
HCT (per 100%)	27.4±5.46	26.3±5.37	23.9±4.70	0.15
MCV (femtolitre)	89.3±14.02	89.5±12.65	86.2±13.98	0.42
MCHC (g/dL)	29.7±4.61	29.3±5.70	29.0±4.83	0.83
Reticulocyte count (per ml)	1.4±0.41	1.8±0.30	1.9±0.58	0.25
Platelet count (per ml)	70.5±2.51	64.3±6.49	63.1±8.52	0.62
Prothrombin time (sec)	15.8±3.68	17.2±4.62	18.5±5.02	0.75
RDW (per 100%)	19.2 ±1.70	18.7±2.41	19.0±1.45	0.86

Table III shows that mean Hb (g/dL) was 10.4, 8.5 and 5.2, TLC (per ml) was 8.9, 10.8 and 9.4, HCT (per 100%) was 27.4, 26.3 and 23.9, MCV (femtolitre) was 89.3, 89.5 and 86.2, MCHC (g/dL) was 29.7, 29.3 and 29.0, reticulocyte count (per ml) was 1.4, 1.8 and 1.9, platelet count (per ml) was 70.5, 64.3 and 63.1, prothrombin time (sec) was 15.8, 17.2 and 18.5 and RDW (per 100%) was 19.2, 18.7 and 19.0 in mild, moderate and severe anemia cases. The difference was significant (P< 0.05).

Table IV: Distribution of chronic liver disease patients as per the Child-Pugh Score

Child-Pugh Score	Number (n=72)	Percentage
Class A	4	5.55
Class B	10	13.89
Class C	58	80.55

Among patients with chronic liver disease, Table 3 shows a significantly higher Class C Child-Pugh Score of 58 (80.55%), the class-based predictor of the severity of long-term liver disease. This draws attention to the fact that most cases of chronic liver disease have a Child-Pugh score of Class C (severe), suggesting advanced hepatic dysfunction. Therefore, early detection of severe liver damage may help clinicians plan a treatment strategy that will be more beneficial in the future.

Discussion

Anaemia of CLD can be accompanied by anaemia of chronic disease, iron loss (blood loss), folate deficiency, hypersplenism, aplastic anaemia (viral hepatitis is rare), sideroblastic (alcohol), disseminated intravascular coagulation (DIC) (rare), microangiopathy, and autoimmune origin (rare).[8,9] The present study was conducted to assess haematological profile of patients with chronic liver disease (CLD).

We found that out of 72 patients, males were 40 and females were 32. In present study we found that 85.9% of chronic liver disease patients have Class C Child-Pugh Score.

Joshi et al.[10] analysed the spectrum of anaemia in patients with CLD, and predict CLD outcomes utilizing Child-Pugh Score. Most patient's blood pictures reported normocytic normochromic with thrombocytopenia (TCP) (28.7%), macrocytic hypochromic with TCP (26%), microcytic hypochromic with TCP (13.3%) and macrocytic normochromic with TCP (9.3%). The incidence of anaemia was 85.3%: mild in 12.7% patients, moderate in 55.3% patients, and severe in 17.3% patients. Interestingly, this study also builds upon others suggesting that 85.9% of CLD patients have Class C Child-Pugh Score.

We found that haematological profile was macrocytic type with neutrophilic leucocytosis with TCP in 13, dimorphic picture (normocytic to macrocytic) in 3, hypochromic microcytic in 2, macrocytic hypochromic in 1, macrocytic hypochromic with TCP in 20, microcytic hypochromic in 2, microcytic hypochromic with TCP in 11, normocytic normochromic with TCP in 16, severe anaemia microcytic hypochromic in 2 and spherocytes with TCP in 2 patients. According to Kaur et al[11], total of 90 patients with chronic liver disease were included in the study. The population was divided into 2 groups based on the model for end-stage liver disease (MELD) score and the various haematological abnormalities were assessed in these 2 groups. Similarly, haemoglobin (Hb) levels were assessed in 3 groups based on the Child Turcotte-Pugh (CTP) classification. There was a significant correlation between hemoglobin and CTP class ($P < 0.001$), with the lowest haemoglobin levels in CTP class C group. The correlation coefficient of MELD score and haemoglobin was -0.504 which was significant statistically. Thus, confirming the fact that haemoglobin levels decrease with the progress in the severity of liver cirrhosis. Of 39 patients with haemoglobin < 8 g/dl, 5 (12.8 %) had a MELD score of < 12, whereas 34 patients (87.2 %) had a MELD score of > 12 and was statistically significant ($P < 0.0001$). Leukocytosis was observed in 41 patients and leucopoenia in 14 patients. The mean prothrombin time was 20.4 seconds and 80 % of the patients had prothrombin time prolonged by more than 6 sec indicating liver damage alters coagulation profile.

We observed that mean Hb (g/dL) was 10.4, 8.5 and 5.2, TLC (per ml) was 8.9, 10.8 and 9.4, HCT (per 100%) was 27.4, 26.3 and 23.9, MCV (femtolitre) was 89.3, 89.5 and 86.2, MCHC (g/dL) was 29.7, 29.3 and 29.0, reticulocyte count (per ml) was 1.4, 1.8 and 1.9, platelet count (per ml) was 70.5, 64.3 and 63.1, prothrombin time (sec) was 15.8, 17.2 and 18.5 and RDW (per 100%) was 19.2, 18.7 and 19.0 in mild, moderate and severe anemia cases. Raja et al.[12] found haematological derangements, specifically leukocytosis, in CLD patients more prevalent than leucopenia and TCP; with the total number of white blood cells ranging anywhere from 1050/mm3 to 16,100/mm3.

Limitations of the study: The shortcoming of the study is small sample size.

Conclusion

The authors found that the majority of patients with chronic liver disease had anaemia, leukopenia, and thrombocytopenia. In the present study, we found that 85.9% of chronic liver disease patients have a Class C Child-Pugh score, suggesting advanced hepatic dysfunction. Therefore, early detection of severe liver damage may help clinicians plan a treatment strategy that will be more beneficial in the future.

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